Bike-to-the-Sea Feasibility Study

A report produced by the Central Transportation Planning Staff for the Massachusetts Highway Department

Bike-to-the-Sea Feasibility Study

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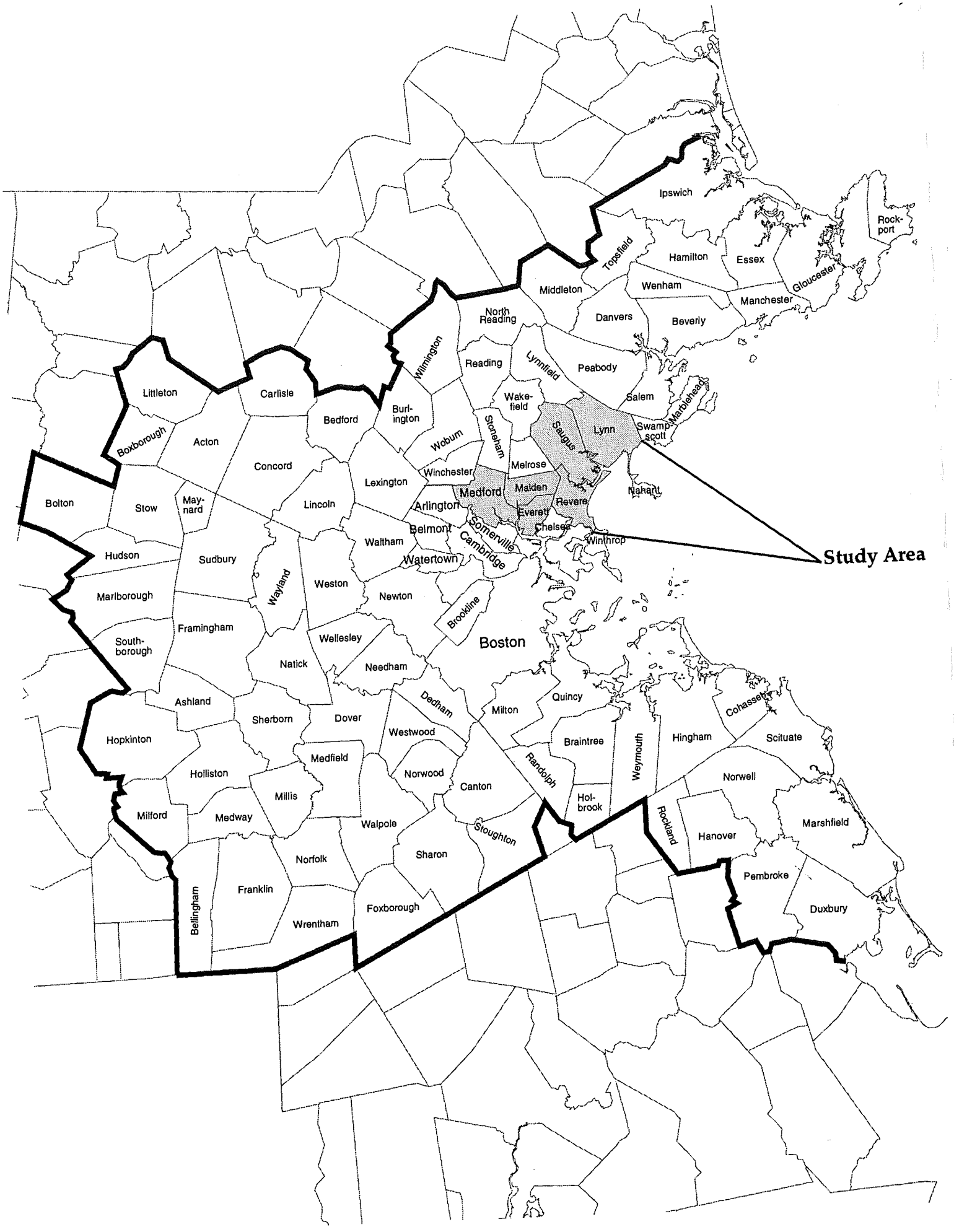
Study Area
Boston
Ipswich
Rock-port
Topsfield
Hamilton
Essex
Gloucester
Middleton
Wenham
Manchester
North Reading
Danvers
Beverly
Wilmington
Reading
Lynnfield
Peabody
Littleton
Carlisle
Bedford
Burl-ington
Wake-field
Salem
Marblehead
Boxborough
Acton
Woburn
Stoneham
Saugus
Lynn
Swamp-scott
Concord
Winchester
Melrose
Lexington
Medford
Malden
Nahant
Bolton
Stow
May-nard
Lincoln
Arlington
Everett
Revere
Belmont
Somerville
Chelsea
Winthrop
Cambridge
Waltham
Hudson
Sudbury
Watertown
Wayland
Weston
Newton
Marlborough
Framingham
Brookline
South-borough
Wellesley
Natick
Needham
Dedham
Quincy
Ashland
Sherborn
Dover
Milton
Cohasset
Hopkinton
Westwood
Braintree
Weymouth
Hingham
Scituate
Medfield
Randolph
Holliston
Norwood
Canton
Norwell
Millis
Hol-brook
Rockland
Milford
Medway
Walpole
Stoughton
Hanover
Marshfield
Norfolk
Sharon
Pembroke
Bellingham
Franklin
Foxborough
Duxbury
Wrentham

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Executive Summary

This is a study to determine if it is feasible to build a trail on the Saugus Branch. The conclusion of the study is that it is feasible to build this facility.

The Saugus Branch, located north of Boston, is an MBTA-owned right-of-way. It begins in Everett, goes through Malden, the northwest corner of Revere, and Saugus, and ends in Lynn, connecting with the main line to Ipswich/Rockport. Connections would need to be made to Wellington Station in Medford, at the southern end, and to Lynn Central Station and the seashore, at the northern end.

A citizens' group, called Bike to the Sea, Inc., has generated interest in having this line made available as a trail. The Boston & Maine (B&M) Railroad has freight rights on the line. Freight presently is carried as far north as Franklin Park, Revere. If the freight service continues and the trail is built, this would be a joint-use right-of-way from Everett to Franklin Park. The B&M has indicated interest in ending freight service on the Saugus Branch. There is room within the right-of-way for joint use, although portions of the track would have to be moved over.

This proposed trail has a large number of at-grade crossings compared to other rail trails that have been developed in the state. Some portions of the right-of-way with fewer at-grade crossings could be developed as a first stage. Whether a portion or all of the trail were built, however, considerable care would need to be taken to ensure that the intersections are designed and built so as to achieve a high level of safety.

This rail trail would be a major asset for the communities it traverses, as well as surrounding towns. It would provide access to many schools and residential and recreational areas. It would act as a connector to regional intermodal facilities such as Lynn Central Station and Malden Center. It would provide links to the centers of Malden, Saugus, and Lynn.

While this facility would be an urban trail in general, there are sections, in Revere and Saugus in particular, that provide wonderful vistas along the Rumney and Saugus Marshes. Given the urban character of the study area, the abundance of such natural vistas is unexpected and delightful.

Introduction

Bike-to-the-Sea, Inc., a non profit organization and a chapter of the Bicycle Coalition of Massachusetts (BCOM), has been promoting the concept of a trail to provide safe access from the Everett-Malden area to the sea. Bike-to-the-Sea targeted the Saugus Railroad Branch as a potential corridor that would allow users to stay off the busy roadway system in the area. This study of a potential trail on the Saugus Branch has been done by the Central Transportation Planning Staff (CTPS) at the behest of the Metropolitan Area Planning Council (MAPC), under the direction of the Massachusetts Highway Department (MHD).

The Saugus Branch is owned by the Massachusetts Bay Transportation Authority (MBTA) and leased to the Boston & Maine Railroad (B&M) to provide freight service. The B&M reports that its trains run about two or three times a month to the vicinity of the Malden-Revere line. From there to the end of the line (where the Saugus Branch joins the main line in Lynn) there is no rail activity. This study examines the possibility of joint rail and trail use along the portion that presently has active rail service and trail use along the inactive portion. If the rail service is discontinued, then the entire line could be available for trail use only.

An advisory committee composed of representatives from communities, agencies, and organizations met during this study. The communities affected are Everett, Lynn, Malden, Medford, Revere, and Saugus. Agencies that have interest in the study include the Executive Office of Transportation and Construction (EOTC), the Metropolitan District Commission (MDC), MAPC, MHD and MBTA. The following individuals have been appointed to and/or participated on the advisory committee:

Everett	Mary Cassidy
Lynn	Tom Coleman
Malden	Steve Winslow
Medford	Karen Green/Clodagh Stoker-Long
Revere	Michael Kelleher
Saugus	Dennis Robitaille
EOTC/MHD	Josh Lehman
MAPC	Joan Blaustein
MBTA	Jane O'Brien/Erik Scheier
MDC	David Queeley/Karl Pastore

Input was also received from citizens attending two public meetings, held on January 24 and June 28, 1995, in Malden and Saugus, respectively. In addition, members of Bike to the Sea, Inc., held three informal meetings in Revere and one in Lynn.

Chapter 1 of this report presents background information on the study area, including demographics, travel patterns, public transportation services, and bicycle and pedestrian accident data. Chapter 2 provides information regarding the Saugus Branch, including its physical dimensions and the motor-vehicle volumes on streets that cross the right-of-way. These data were collected primarily by members of Bike-to-the-Sea, Inc. The final chapter makes recommendations.

1 Existing Conditions

The study area is located north of Boston, within Route 128 (see Figure 1). It is a densely populated area. There is a great deal of commercial activity, especially in Revere, Everett, and Malden. The communities of Lynn and Revere, being on the ocean, experience heavy seasonal traffic.

A History of the Project

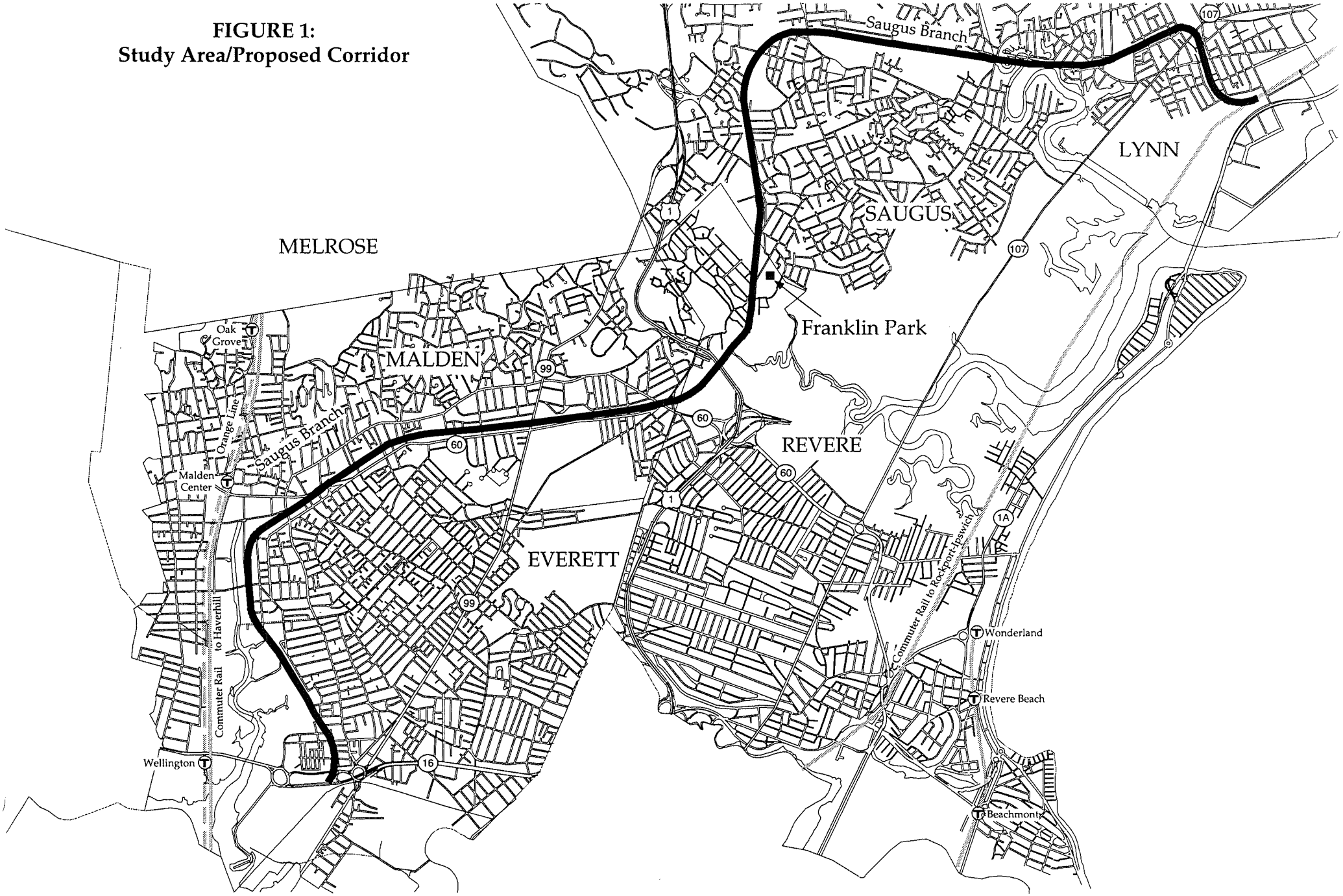
As originally conceived by Bike-to-the-Sea, Inc., this route would begin at Wellington Station, on the MBTA's Orange Line, and proceed on local streets to the MBTA-owned Saugus Branch. The trail would remain in the rail right-of-way until the Saugus/Revere border, where it meets the Rumney Marsh. The trail would proceed along the perimeter of Rumney Marsh, which has been designated by the Massachusetts Department of Environmental Protection as an Area of Critical Environmental Concern (ACEC). Local streets would then be used to reach Revere Beach.

At the first public meeting held on this project, in January 1995, a number of Revere residents protested the potential introduction of many ("thousands") of bicyclists into their neighborhoods. Bike-to-the-Sea members held several meetings in Revere with neighborhood associations and government officials. The upshot of these discussions was that Revere was not interested in the project as proposed.

One of the reasons cited was the possibility of the trail's harming the MDC's Rumney Marsh. The MDC indicated that it seemed feasible to allow a trail on the perimeter of the marsh, assuming a design that was sensitive to its environmental concerns. It appears that the more important issue in Revere was the fear of an influx of trail users into their neighborhoods.

The roads originally selected by Bike-to-the-Sea were very local and indeed not ideal for a regional transportation facility. Even with strong local support in Revere, there do not appear to be good connections in the City from the Saugus Branch-Rumney Marsh area to the sea. The population density and commercial activity in Revere have resulted in development patterns and a road system that do not allow a safe or scenic way to reach the beach from the west. Many people north of Revere use arterials in Revere to reach Boston and points south. These roads, such as Routes 107 and 1A, become effective barriers to non-motorized local traffic.

FIGURE 1:
Study Area/Proposed Corridor



The turn of events in Revere led to a revision of the Bike-to-the-Sea concept. Instead of leaving the rail right-of-way in Saugus, it was decided to examine the feasibility of staying on the Saugus Branch into Lynn. The connection to the sea could be made via local Lynn streets, with a possible connection along the Lynn waterfront south to Revere Beach.

B Demographics

Table 1 gives the population of the six study area communities. Also included in the table are the land area of each community and its resultant population density.

TABLE 1
Population, Land Area, and Population Density
By Community, 1990

	1990 Population	Land Area (Square Miles)	Population Density
Everett	35,701	3.38	10,553
Lynn	81,245	10.82	7,512
Malden	53,884	5.08	10,599
Medford	57,407	8.14	7,055
Revere	42,786	5.90	7,256
Saugus	25,549	10.99	2,326
Total	296,572	44.31	6,693
Mass.	6,016,425	7,836.93	768

Source: 1990 U. S. Census

The study area is decidedly urban, with a population density almost nine times as high as the statewide average. The two most densely populated communities are Everett and Malden, with over 10,000 residents per square mile. Lynn, Medford, and Revere are fairly similar in population density, all over 7,000. Saugus is markedly lower than all the other communities, at 2,326, yet is still three times the statewide average.

It is interesting to note that only seven communities in Massachusetts have population densities over 10,000, and two of them are in the study area. The other five are Boston (11,858), Cambridge (14,903), Chelsea (13,181), Lawrence (10,087), and Somerville (18,556).

Table 2 indicates the modes of transportation that residents in the study area use to get to work. As can be seen, almost two out of three resident workers drive alone. Most of the remaining third either use public transportation or carpool.

TABLE 2
Transportation Modes Used to Get to Work
By Community, 1990

	Workers, 16+	Drive Alone	Transit, Pool, Etc.	Bicycle	Walk
Everett	17,279	10,571	5,742	8	958
Lynn	35,262	24,468	8,084	80	2,117
Malden	28,068	16,259	10,506	37	1,266
Medford	29,948	19,632	8,863	67	1,386
Revere	20,032	12,362	6,780	51	839
Saugus	13,197	10,664	2,355	8	173
Total	143,786	93,956	42,330	251	6,739
% of total	100	65	29	0.2	5
E. Massachusetts	2,073,508	1,443,252	504,939	8,843	116,474
% of total	100	70	24	0.4	6

Source: U. S. Census Journey-to-Work data

It should be noted that these percentages are estimates based on a sample questionnaire. Only workers over 16 years of age are included. All students, including those over 16, are excluded. These are census data which are collected in early spring, when, according to metropolitan Boston counts, bicycle volumes are about one-quarter of the peak-season volumes. It is not known what the seasonal variations are for pedestrians, but pedestrian volumes are assumed to be less variable than bicycle volumes. Another factor to consider is that the census questionnaire asks for the mode used for the longest part of the trip to work. A trip involving a two-mile bicycle trip to a rail station, a five-mile train trip, and a half-mile walk to the office would be classified as a rail trip.

Table 3 indicates both the number and the percentage of people by community who bicycle and walk to work. The percentage of those who walk to work is between four and six percent for all of the study communities except Saugus, where it is only 1.3 percent. In general, many more walk to work than bicycle to work. In the entire study area, the ratio of commuting walkers to commuting bicyclists is about 27 to one.

TABLE 3
Number and Percentage Bicycling and Walking to Work
By Community, 1990

	Bicycling		Walking	
	#	%	#	%
Everett	8	0.05	958	5.5
Lynn	80	0.22	2,117	6.0
Malden	37	0.13	1,226	4.4
Medford	67	0.22	1,386	4.6
Revere	51	0.25	839	4.2
Saugus	8	0.06	173	1.3
Total	251	0.17	6,739	4.7
E. Mass.	8,843	0.40	116,474	5.6

Source: U.S. Census Journey-to-Work data

The fact that few people bicycle to work does not mean that a trail in this area would not be used. Trail use in this corridor is not expected to be as high as that on the Minuteman Path. Bicycling in the Minuteman corridor was higher than it is in this corridor even before the Minuteman was built. This trail would be expected to attract many recreational and commuter bicyclists, walkers, and skaters, however. One of the reasons people do not bicycle to work is that there are no separate facilities for it and many people fear sharing the street system with motor vehicles. It is expected that if this trail is built, there would not only be commuters using it to reach their workplace or transit connection, but others who by using the trail would become more used to bicycling and more apt to venture onto the streets.

C Public Transportation

Rail transportation in the study area is provided by the MBTA via two commuter rail and two rapid transit lines. The Rockport-Ipswich commuter rail line has one station in the study area at Central Square, Lynn. The Haverhill/Reading Line also has one, at Malden Center. The Orange Line has stations at Wellington, Malden and Oak Grove, the last three stations on that line. Blue Line stations are located at Beachmont, Revere Beach, and Wonderland, also the last three stations on that line.

There are also both local and express MBTA bus routes in the study area. There are more than twenty local routes; most are located in the Malden-Everett-

Revere area. All of these routes feed a commuter rail or rapid transit station. There are five express bus routes which traverse the study area, one of which begins in Lynn. The other four begin north of the study area.

Bicycles are allowed during off-peak hours on all commuter rail lines, provided the bicyclist has obtained a bicycle permit from the MBTA. This allows bicycle access on all inbound trains after the morning peak and on all outbound trains except during the evening peak. Bicycle access on the rapid transit lines is allowed, using the aforementioned bicycle permit, although the hours of access are different. Bicycles are allowed on the rapid transit lines on weekdays between 10 AM and 2 PM, and after 7:30 PM, and all day Saturdays and Sundays. There is no bicycle access on MBTA buses.

D Accident Data

The accident data discussed in this report were obtained from the MHD, which in turn obtained the data from the Massachusetts Registry of Motor Vehicles. These 1989 through 1991 data are the most recent that have bicycle and pedestrian accidents sorted separately. The data are limited. First, for many of the reported accidents there is not complete information, especially regarding location. Second, many accidents are not reported, especially bicycle accidents that involve falls but do not involve impact with a motor vehicle.

Table 4 shows the number of bicycle and pedestrian accidents by community and the rate per thousand residents. The largest number of bicycle as well as pedestrian accidents occur in Lynn. The 102 bicycle accidents there are about four times the number found in Everett or Saugus, about three times the number in Medford, about twice the number in Malden, and about 40 percent more than those recorded in Revere. Controlling for population, however, the bicycle accident rate in Revere is the highest in the study area, at 1.47 accidents per thousand residents. Lynn's is second at 1.26. The other four communities' rates are significantly lower, ranging from Malden's at 1.00, to Medford's at 0.66.

There are more than twice as many pedestrian accidents as bicycle accidents in the study area and more pedestrian than bicycle accidents in each community. In both Everett and Malden, there are more than three times as many pedestrian accidents as bicycle accidents. At the other end of the scale, there are less than twice as many pedestrian accidents as bicycle accidents in Lynn and Medford. The number of pedestrian accidents per 1,000 residents ranged from the highs of 3.72 in Revere and 3.03 in Malden to lows of 1.72 in Saugus and 1.25 in Medford. During the period 1989-1991, there were 17 pedestrian fatalities and no bicycle fatalities in the study area.

TABLE 4
Number of Bicycle and Pedestrian Accidents,
by Community
per One Thousand Residents
1989-1991 Inclusive

	Population	# Bicycle Accidents	Bicycle Accidents per 1,000	# Pedestrian Accidents	Pedestrian Accidents per 1,000	Fatalities	
						Bicycle	Pedestrian
Everett	35,701	27	0.76	91	2.59	0	0
Lynn	81,245	102	1.26	178	2.19	0	4
Malden	53,884	54	1.00	163	3.03	0	1
Medford	57,407	38	0.66	72	1.25	0	5
Revere	42,786	63	1.47	159	3.72	0	5
Saugus	25,549	21	0.82	44	1.72	0	2
total	296,572	305	1.03	707	2.38	0	17
Massachusetts	6,016,425	5,761	0.96	10,632	1.77	34	376

Sources: 1990 U.S. Census (population); Mass. Registry of Motor Vehicles (accidents).

There is not enough information to determine why certain communities have higher rates of accidents than others. Possible explanations are higher levels of motor-vehicle traffic and higher levels of walking and bicycling. "Exposure rates," rates that take into account these volumes and indicate the number of accidents per given level of traffic, are not determined for this study. If available, they would highlight areas that have particularly high numbers of accidents due to factors other than simply high levels of traffic. These other factors include, but are not limited to, excessive speed, disregard of traffic signals, lack of space for pedestrians and bicyclists, and poor sight distance.

To determine specific areas where accidents were concentrated, the accidents for the years 1989 through 1991 were mapped by community. These are shown in Figures 2 through 7. The reader is reminded that many accidents are not shown on the maps because insufficient information was provided in the accident report regarding location.

In some cases, no accident concentrations will be seen. In other cases, specific intersections or roads will be seen to be the location of many accidents. Again, the location of accidents may be a reflection of volumes of pedestrian and bicycle traffic

as well as an indication of hazardous conditions. That is, the accidents may be occurring where the most activity is occurring. An intersection with a large number of accidents may be as safe from a traffic design point of view as another with no accidents: one is a location where many bicyclists and pedestrians travel; the other is one where little such traffic occurs.

This is not to say that nothing needs to be done at high accident locations. On the contrary, these locations need an engineering study to determine whether there are design issues that need to be addressed. Additional measures need to be taken to reduce these accident rates and it is important to determine what type of measures-special signage, targeted police enforcement, traffic control, design changes-would be most effective. Likewise, the lack of accidents cannot be taken as a measure of safety. It is most appropriate for these types of analysis to be performed by a local bicycle committee and local staff.

There are arterials throughout the study area that have high levels of commercial activity, usually have parking on both sides of the street, and have high volumes of traffic. People driving on this type of road often can become distracted if looking for stores or parking spaces. Also, the parked cars become obstructions that decrease the sight distance for vehicles entering the road from side streets or driveways.

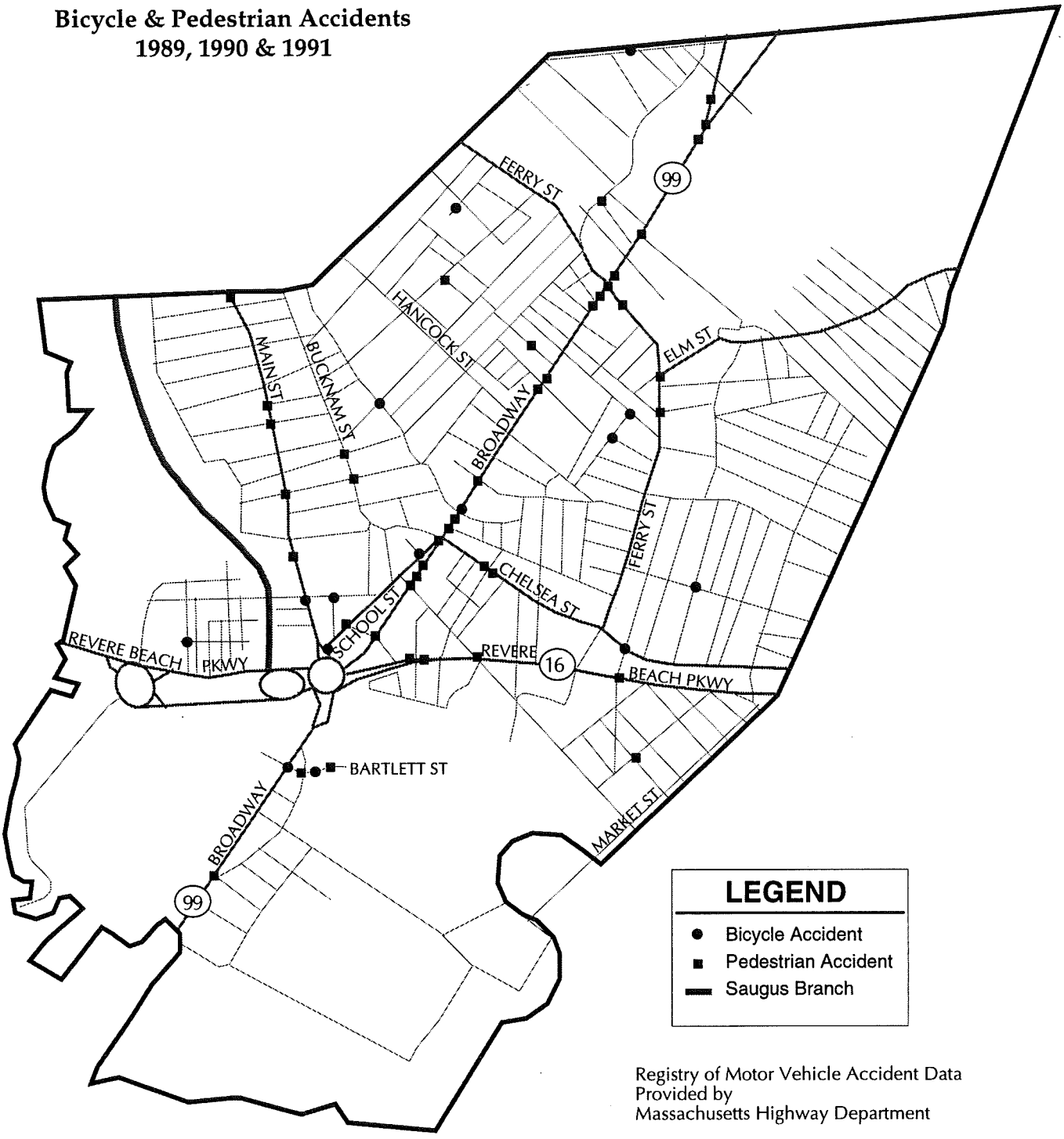
Both the distracted drivers and the limited sight distances pose hazards for pedestrians and bicyclists. The pedestrians are coming out from behind the parked cars to cross the street. The bicyclists are further to the right on the roadway than the motor vehicles and more likely to be blocked visually by the parked vehicles. This and the tendency of people to open their car doors without checking behind them are two important reasons for bicyclists to give wide berth to parked vehicles.

Figures 2 through 7 show accident locations by community for 1989-1991. The Saugus Branch is represented on these maps by a heavy gray line.

Everett

Figure 2 shows bicycle and pedestrian accidents in Everett. In regard to pedestrian accidents, the road with the largest number was Route 99 (Broadway). Accidents occurred along the entire length of that arterial. There were also a large number on Main Street. These are both the type of arterial described above, with parking on both sides and high levels of commercial activity. Bicyclists and pedestrians would likely use a trail on the Saugus Branch rather than the parallel Main Street, unless they were making very short trips. Some bicyclists on Route 99 could be diverted to a trail, depending on trip destinations. Other locations of pedestrian accidents were Bartlett, School, Bucknam, Chelsea, and Ferry Streets. There were many fewer bicycle accidents than pedestrian accidents in Everett. They

FIGURE 2
Everett
Bicycle & Pedestrian Accidents
1989, 1990 & 1991



Registry of Motor Vehicle Accident Data
Provided by
Massachusetts Highway Department

were scattered throughout the town, except for two on Bartlett Street just off Broadway.

Malden

As can be seen in Figure 3, there was one pedestrian fatality in Malden, on Ferry Street. Many pedestrian accidents occurred on Route 60, Highland Avenue, Route 99 (Broadway), Main Street, the Pleasant-Salem Street corridor, Medford Street, Lebanon Street, and Maplewood Street. The others were more scattered.

The bicycle accidents in Malden were not as concentrated, although many occurred at the same locations as pedestrian accidents. The most likely streets to experience reductions in pedestrian and bicycle activity if a trail were built are Route 60 (Eastern Avenue) and Salem Street. Longer-distance trips would also be diverted from Route 99.

Medford

In Medford (see Figure 4) there were again many more pedestrian than bicycle accidents. There were five fatalities in the 1989-1991 period, all involving pedestrians: two on Route 60, two on Route 28 (the Fellsway), and one on Main Street. There were clusters of pedestrian accidents on Revere Beach Parkway just east of the Fellsway, at the Forest Street interchange with Route I-93, and on High Street at Governors Avenue.

Bicycle accidents were scattered throughout Medford, except for several that occurred near the intersection of Routes 16 and 28, along the Fellsway, and another several that happened near the Main Street/Mystic Avenue intersection.

Revere

There were five pedestrian fatalities in Revere during this three-year period (see Figure 5). Two occurred on Revere Beach Boulevard, two on or just off of Route 60, and one on Ocean Avenue. There were almost thirty bicycle and pedestrian accidents along Revere Beach Boulevard during these three years, over half involving pedestrians.

Fifteen accidents occurred in a concentrated area between the Route 1A/107 rotary and Ocean Avenue. Many side streets in that area also had numbers of accidents. Many occurred along Route 60, again predominantly involving pedestrians. Concentrations of accidents also occurred at Route 60 and Broadway (Route 107), on Revere Street both at Route 1A and at Ocean Avenue, and on Route 107 at Mountain Avenue. The clustering of accidents in Revere was very high.

FIGURE 3
Malden
Bicycle & Pedestrian Accidents
1989, 1990 & 1991

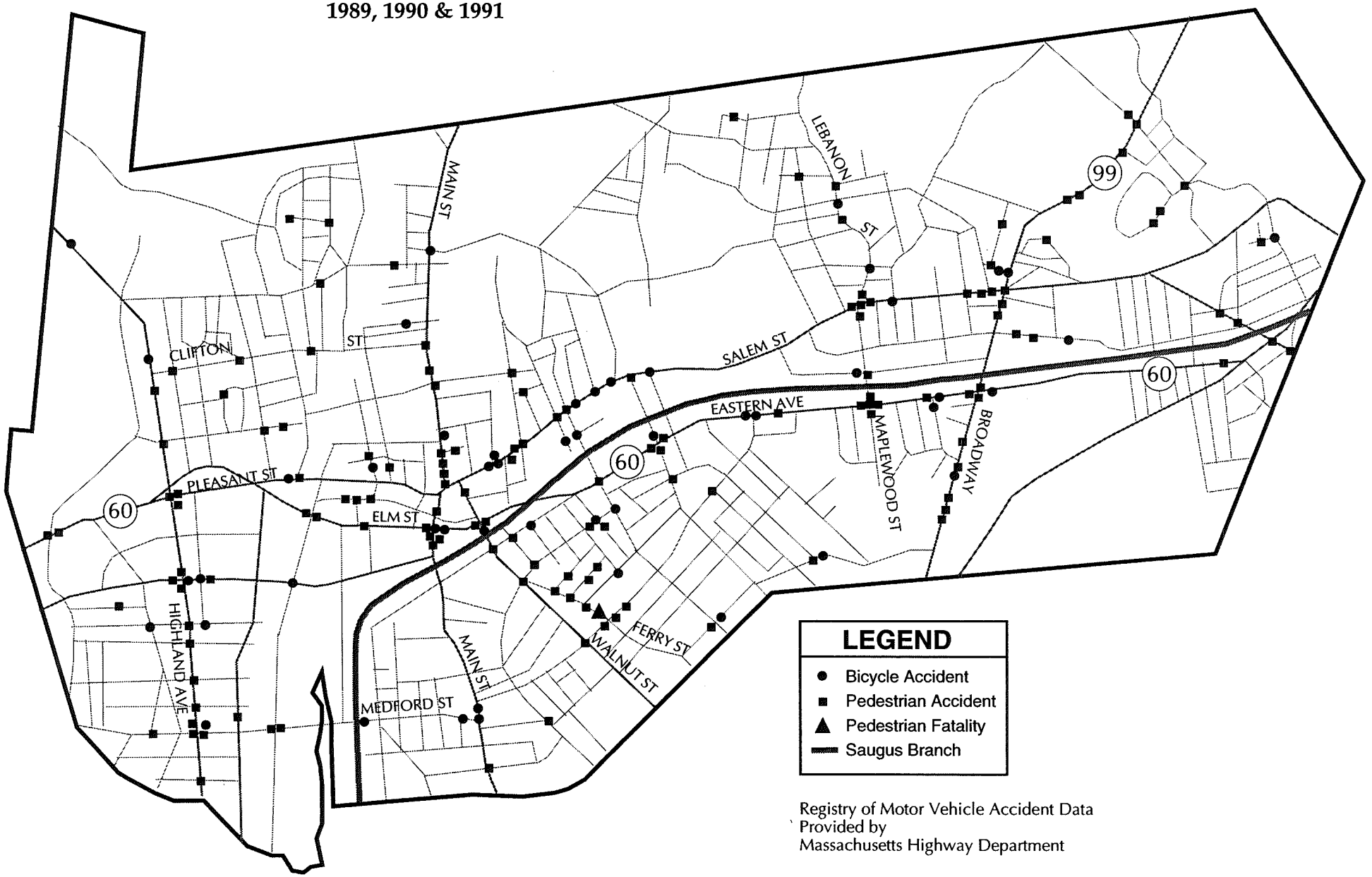


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FIGURE 4
Medford
Bicycle & Pedestrian Accidents
1989, 1990 & 1991

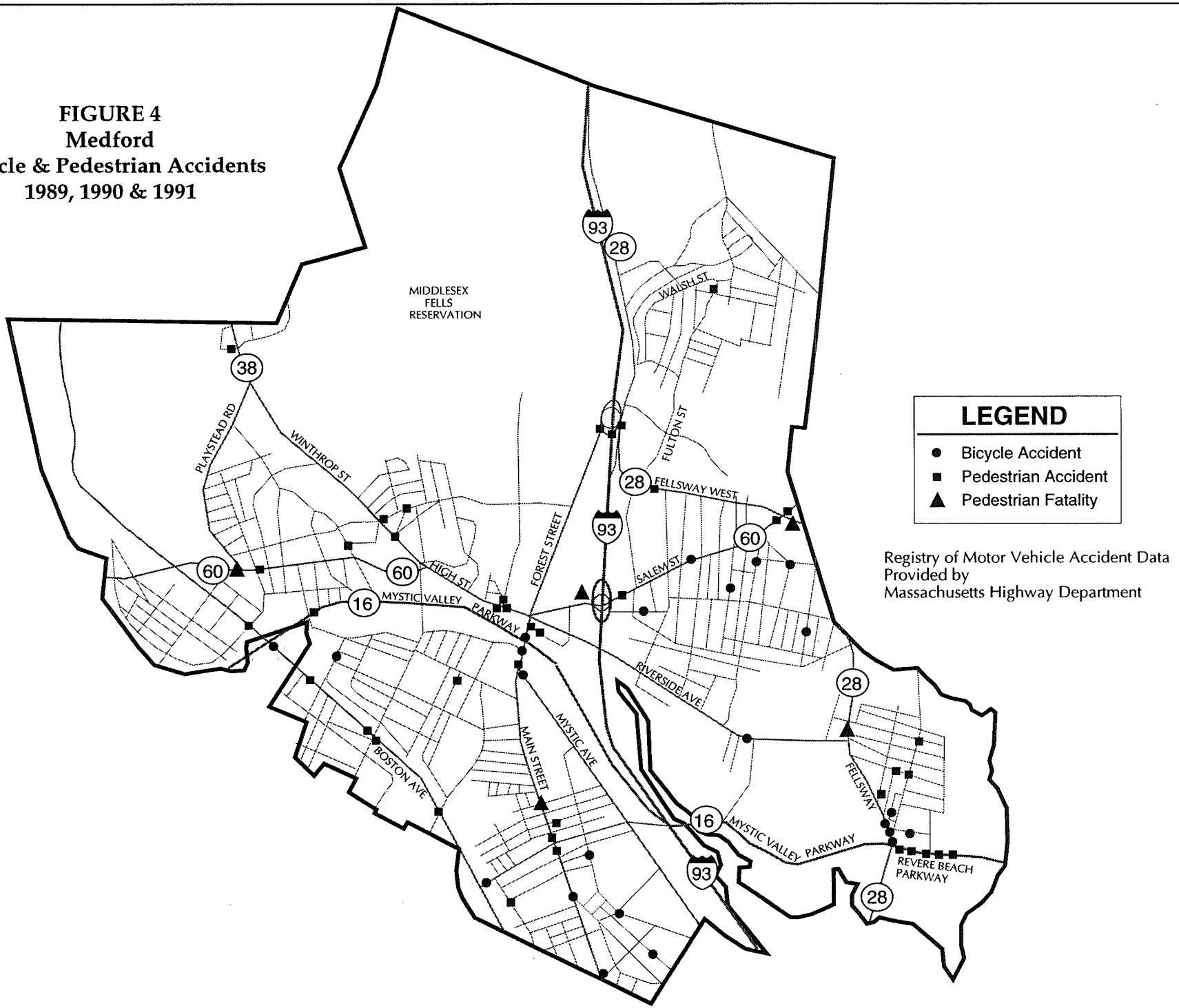
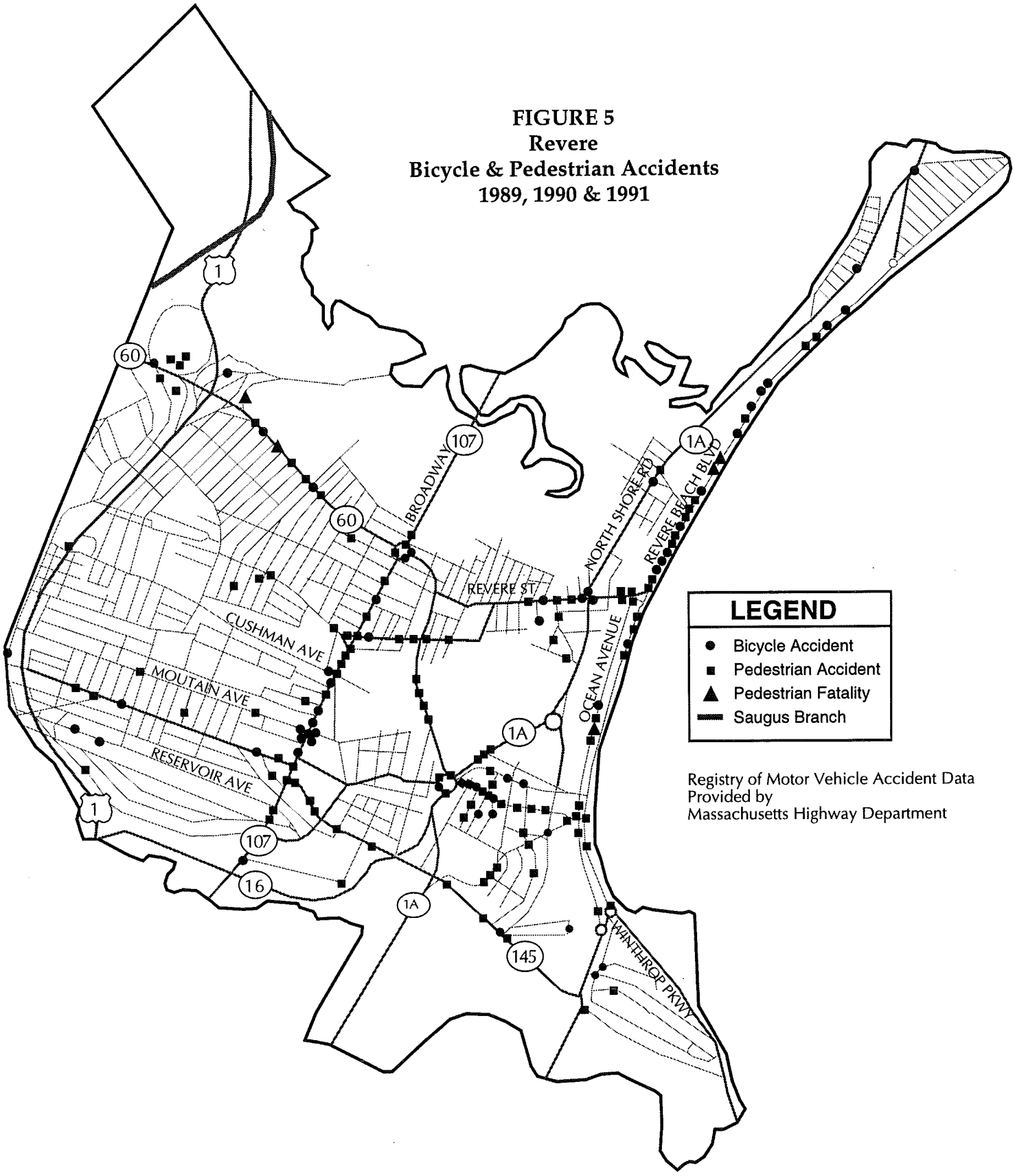


FIGURE 5
Revere
Bicycle & Pedestrian Accidents
1989, 1990 & 1991



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Saugus

As indicated in Figure 6, there were two pedestrian fatalities in Saugus, one on Route 107, the other on Route 1. The ratio of pedestrian to bicyclist accidents was about two-to-one. The only concentrated area of accidents was at the Lincoln Avenue/Essex Street intersection, just east of the Saugus Branch. There were seven accidents within the Route 1 corridor and five along the Main-Hamilton Street corridor east of Route 1. The construction of a trail on the Saugus Branch might attract trips presently being made on Main, Hamilton, Central, and Chestnut Streets.

Lynn

Bicycle and pedestrian accidents in Lynn are shown in Figure 7. There were significant concentrations along Route 107 and along Route 129-especially the section west of Route 107, near Parkland Avenue-and along Route 1A. One of the four pedestrian fatalities occurred on Route 1A, at Commercial Street. The other three fatalities occurred in the Lynn Common area. There were many other locations with concentrations of accidents, including Boston, Union, Lewis, and Franklin Streets.

Given the location of the Saugus Branch in the southern section of the City, it is unclear how many of the pedestrian and bicycle trips being made in Lynn might be diverted to a trail. Certainly those along the southern portion of Route 107 would be likely candidates, as well as those using Boston Street and other more local roads in the area.

FIGURE 6
Saugus
Bicycle & Pedestrian Accidents
1989, 1990 & 1991

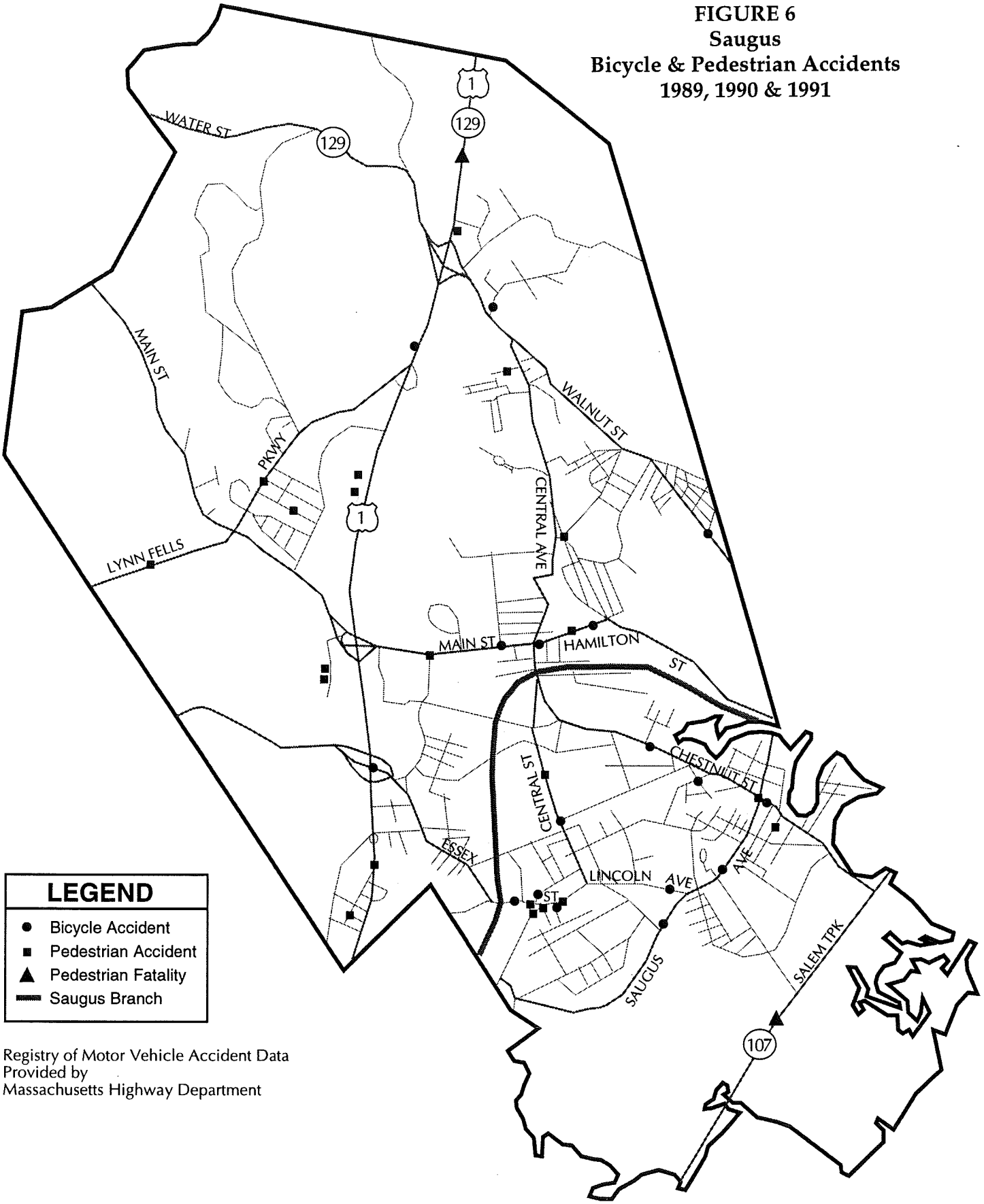

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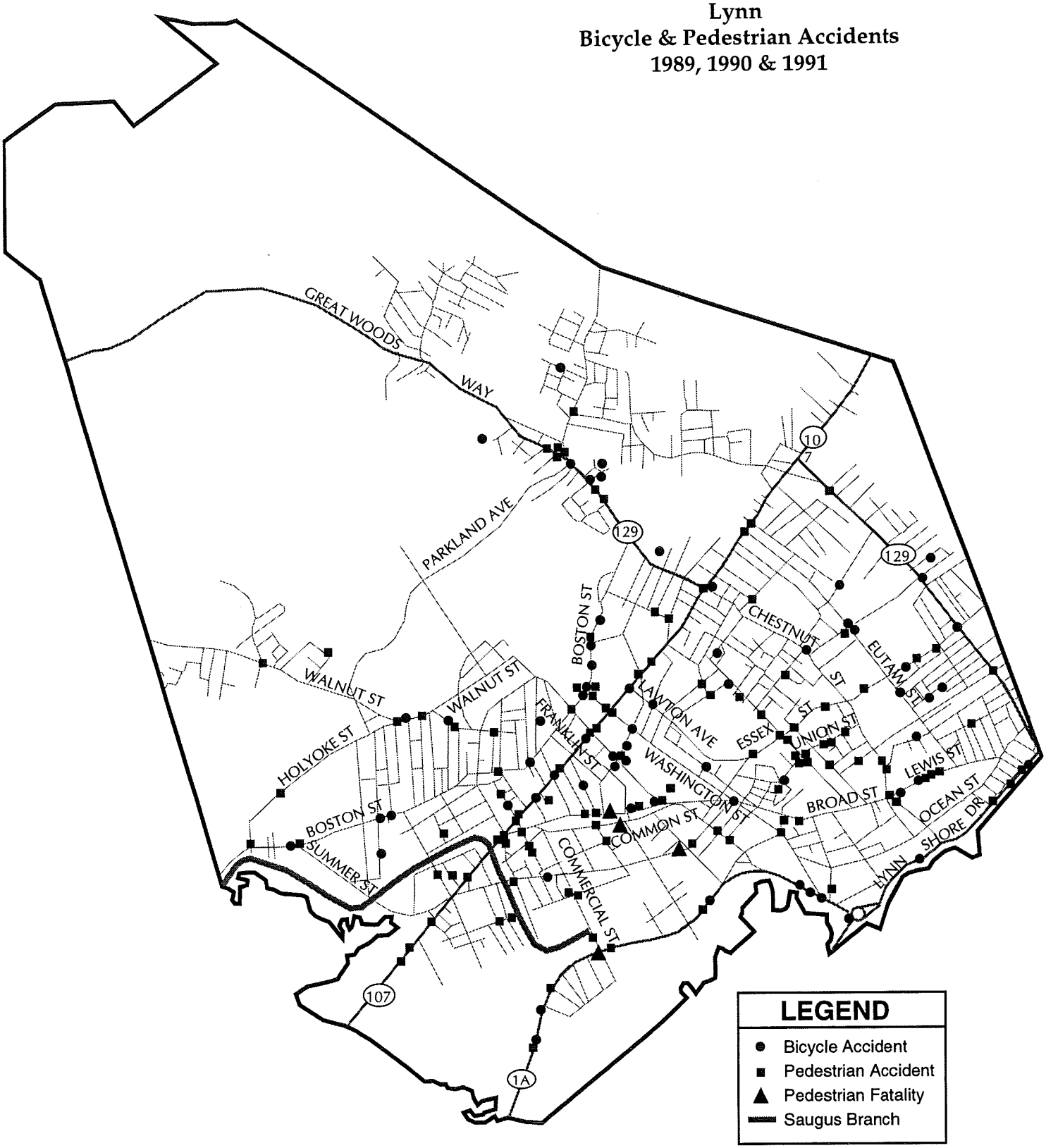
FIGURE 7
Lynn
Bicycle & Pedestrian Accidents
1989, 1990 & 1991



Registry of Motor Vehicle Accident Data
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2 The Rail Trail Alternative

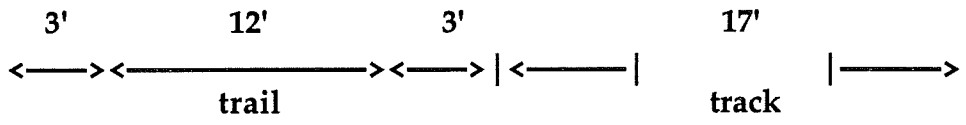
The Saugus Branch is over nine miles long, from its branch off the main line in Everett to its connection to the Rockport/Ipswich line in Lynn. Originally a two-track line, it is now single-track along most of the right-of-way. (Short sections are double- and even triple-track). The Boston and Maine Railroad (B&M) leases the line from the MBTA to provide freight service from Boston to Franklin Park in Revere. B&M reports making several trips a month on the line. The actual frequency may be quite variable. The B&M has indicated interest in abandoning these freight operations.

The portion of the line beyond Franklin Park is presently inactive, although not abandoned. It had been used to provide wide-load service from the General Electric (GE) plant in Lynn. The loads consisted of turbines manufactured at GE. This type of manufacturing has been transferred to another GE plant, and the building used to make those turbines has been torn down. Without the need for wide loads, future freight service to GE could be done on the main line.

A Physical Dimensions

An initial question is whether there is room for joint rail and trail use on the portion of the line that is still active. The preferred track width is 8.5 feet from the centerline to an obstruction on either side, or 17 feet for the track and clearances. These figures were suggested by the MBTA as preferred clearances on an active rail line. For the trail, the preferred width is 12 feet with three feet on each side for clearances. The total width requirement is then 18 feet for the trail and its clearances and 17 feet for the track and its clearances, or 35 feet. (See Figure 8.)

FIGURE 8
Preferred Joint-Use Cross Section



In the portion of the line that is active, the width varies from 38 to 82 feet, allowing enough room for joint use. In the inactive portion beyond Franklin Park, there is sufficient room to maintain the possibility of joint use, should freight service be re-established, except for two short sections, both near the Saugus-Lynn line. If the need to maintain freight viability were not considered, these sections would be ample for trail use only.

It should be noted that any trail built on this MBTA-owned right-of-way could be subject to a short-term reversion clause in the lease. That is, the MBTA could maintain the right to revert the line to rail use upon fairly short notice. This is the case on the MBTA-owned corridor where the Minuteman Path is built.

Construction of a twelve-foot path would mean that all users would share the same trail. Conflicts have come up on other trails such as the Minuteman Path and would likely emerge on the Bike-to-the-Sea, as well. The major conflicts are between the faster users such as bicyclists and in-line skaters, and walkers. There also appears to be conflicts between in-line skaters and bicyclists, as the skaters use a side-to-side motion that takes up a lot of pavement space. A physical solution is separate trails. This is expensive and two trails would take up significantly more lateral width. A line down the middle of the Minuteman Path has been useful in keeping traffic to the right. It is also important that speed limits be set and enforced. High-speed bicycling and skating are not appropriate on crowded trails. Also, education of all users is important so they understand the needs of others. Dog owners, for example, might wish to let their pets roam free, not realizing that a dog can dart across a trail and collide with a bicyclist or skater, causing serious injury. Likewise pedestrians have to learn not to make sudden lateral movements.

B <u>At-Grade Crossings</u>

One of the benefits of using a separate trail compared to sharing streets is that it diminishes the potential for conflicts between users and motor vehicles. The Minuteman Bikeway, for example, is an eleven-mile trail with 17 at-grade intersections. A bicyclist on the parallel street system would need to negotiate about one hundred intersections to make the equivalent trip. Using the Minuteman, therefore, decreases a bicyclist's exposure to motor vehicles at intersections by a factor of six.

Table 5 is a comparison of the number of at-grade intersections per mile of the major Massachusetts rail trails with the proposed Bike-to-the Sea Trail. The Norwottuck Trail, located in the Amherst area, is eight miles long and has eight intersections, or about one per mile. The 25-mile Cape Cod Rail Trail has about twenty-five at-grade crossings, or one per mile.

TABLE 5
Comparison of Rate of Occurrence of At-Grade Intersections on Saugus Branch and on Major Massachusetts Rail Trails

	Length (mi.)	At-Grade Intersections	Bridges	Miles per At-Grade Crossing
Cape Cod Rail Trail	25.0	25	4	1.00
Minuteman	11.0	17	5	0.65
Norwottuck	8.0	8	4	1.00
Saugus Branch	9.4	27	4	0.35

An example of another type of trail is the Dr. Paul Dudley White Path along the Charles River. The intersections are at the bridge crossings, which are fairly infrequent, given the expense of bridges. The Dr. Paul Dudley White path is about 20 miles long (ten miles on each side of the river) and has 17 intersections, or 1.2 miles per intersection.

The Saugus Branch, located in a more densely developed corridor than these other rail trails, is 9.4 miles long and has 27 at-grade intersections. This means that, on average, a bicyclist would have to negotiate an at-grade intersection every third of a mile. This rate of at-grade intersections is about three times greater than the rates on two of the other trails cited above, and twice that of the Minuteman Path. In terms of intersection density, this trail could be compared to a sidewalk-type path, such as the one in the Southwest Corridor along the Orange Line. This type of path parallels roads and has to negotiate an intersection every time there is a cross street.

The intersection crossings are a concern primarily because trail users and motor vehicles come together at these points. There are other conditions that can exacerbate this situation. The trail users along rail-trail corridors oftentimes are coming to the crossing streets at mid block. Up until the time of crossing, they have been invisible to the motorists because they are traveling on separate corridors. If they were traveling along the road with motor vehicles (as is the case on the Southwest Corridor Path cited above), the motorists and trail users would possibly have a longer time to react to each other. *The overall concern about intersection safety and design is underlined by the fact that most bicycle-motor vehicle accidents occur at intersections.*

The number and rate per mile of intersections along the Saugus Branch vary significantly by community. Table 6 indicates these variations.

TABLE 6
Number of At-Grade Intersections,
Number per Mile, By Community

	# At-Grade Intersections	# Miles	# per Mile
Everett	1	1.0	1.0
Malden	11	3.2	3.4
Revere	1	1.0	1.0
Saugus	7	2.6	2.7
Lynn	7	1.6	4.4
Total	27	9.4	2.9

As can be seen, there is only one intersecting road in Everett. This lack of road crossings results from the fact that there is one bridge and the Mystic River parallels the right-of-way in this area. The density is lower in Revere because there is also a grade-separated crossing there (Route 1) and because the right-of-way, going through a relatively undeveloped part of Revere, hugs the northwest side of the Rumney Marsh.

The density of intersections in Saugus is slightly below the average for the whole right-of-way and about a third below the higher rates found in Malden and Lynn. The population density in Saugus is definitely the lowest in the study area (see Table 1), and the right-of-way goes through the Shute Brook area in East Saugus. The much higher population densities of Malden and Lynn, coupled with the fact that the right-of-way goes through the downtown areas of both communities, make it actually surprising that there isn't more of a difference between those two communities and Saugus.

There are many factors that determine the level of safety of a street that is crossing this potential trail, including traffic volumes, sight distance and reaction time, speed of traffic, gaps in traffic, and the width of the intersection. Very low traffic volumes mean there may be plenty of opportunities for trail users to cross when no motor vehicles are present. On the other end of the scale, if the traffic is so high as to be very congested, motorists who are already stopped might be quite amenable to allowing trail users to cross in front of them.

Sight distance is how far away the oncoming motorist (or the trail user) is before the intersection is sighted. Reaction time is clearly related to the sight distance available to the driver and trail user.

The reaction time is directly related to the speed of the vehicle. Another factor affecting sight distance, and therefore reaction time, is the presence of visual obstacles. If the trail comes right out from behind a building, or if parked cars block the view of the trail, less reaction time will be available.

Another important factor is whether there are gaps in the motor-vehicle traffic, due primarily to nearby traffic signals, that would allow trail users time to cross safely. Finally, the width of the intersection is a factor in that a wide intersection requires a trail user to spend more time in an exposed area.

A wider intersection is also likely to have more travel lanes. One of the most dangerous situations in a multi-lane configuration is when traffic in some lanes stops and traffic in other lanes does not. All of these factors are important in designing the specific measures needed at a particular crossing.

Members of Bike-to-the-Sea, Inc., did traffic counts on most of the streets that cross the Saugus Branch. The results are shown in Table 7.

All of the major streets were counted. Most of the counts were done in June 1995. A few additional counts were completed in December 1995. They were done on Saturdays, between 11:00 AM and 2:00 PM. This time period was selected because it is likely to be a period both when the trail would be heavily used and when there would be relatively high motor-vehicle traffic volumes. It is clearly not the peak for motor-vehicle volumes alone.

The intersections are ranked in Table 7 by total volume crossing the right-of-way. (Total volume means two-way volume if it is a two-way street.) The results of the traffic counts are shown graphically in Figure 9.

As indicated in Table 7, the two largest volumes are on the numbered highways that cross the right-of-way: Route 107 (Western Avenue) in Lynn and Route 99 (Broadway) in Malden. The hourly volume of over 2,000 vehicles on Route 107 is the equivalent of over 30 vehicles per minute. By contrast, the cross roads with the least traffic have only one or two vehicles per minute.

Just as the more local roads generally have less traffic, they also tend to have lower speed limits and lower prevailing speeds. The lower speeds allow more reaction time and may result in an increased tendency to stop and yield to trail users. Also, these roads are more apt to be used by local drivers who know the trail is there and that it is used by their neighbors and children, and even themselves.

TABLE 7
Ranking of Streets Crossing the Right-of-Way, by Total Motor-Vehicle Volume

Intersection	Community	Total Volume
Western Avenue (Route 107)	Lynn	2,057
Broadway (Route 99)	Malden	1,524
Central Street	Saugus	1,333
Main Street	Malden	1,302
Medford Street	Malden	1,192
Lincoln Avenue	Saugus	1,118
Salem Street	Revere	911
Essex Street	Saugus	875
Maplewood Street	Malden	775
Beach Street	Malden	765
Summer Street (eastern end)	Lynn	646
Lynn Street	Malden	620
Summer Street (western end)	Lynn	476
Spencer Street	Lynn	258
School Street	Saugus	213
Adams Avenue	Saugus	168
Bryant Street	Malden	157
Faulkner Street	Malden	150
Denver Street	Saugus	108
Cross Street	Malden	52
Franklin Street	Malden	50

C Connections Provided by the Trail

Walking along the Saugus Branch, one might think that it was built specifically to connect schools and recreation areas. These and other points of community interest are shown in Figure 10. In Everett, the portion of the right-of-way south of the Revere Beach Parkway is industrial. Further north it is bordered by the Mystic River on the west and residential neighborhoods on the east. There are two playgrounds adjacent to the right-of-way: Appleton Street and Babe Ruth. The Sacremone and Baldwin Street playgrounds are close by.

Proceeding into Malden, the right-of-way provides access to the following parks and playgrounds: MacArthur, Kierstead, Roosevelt, Hunting Field, Linden

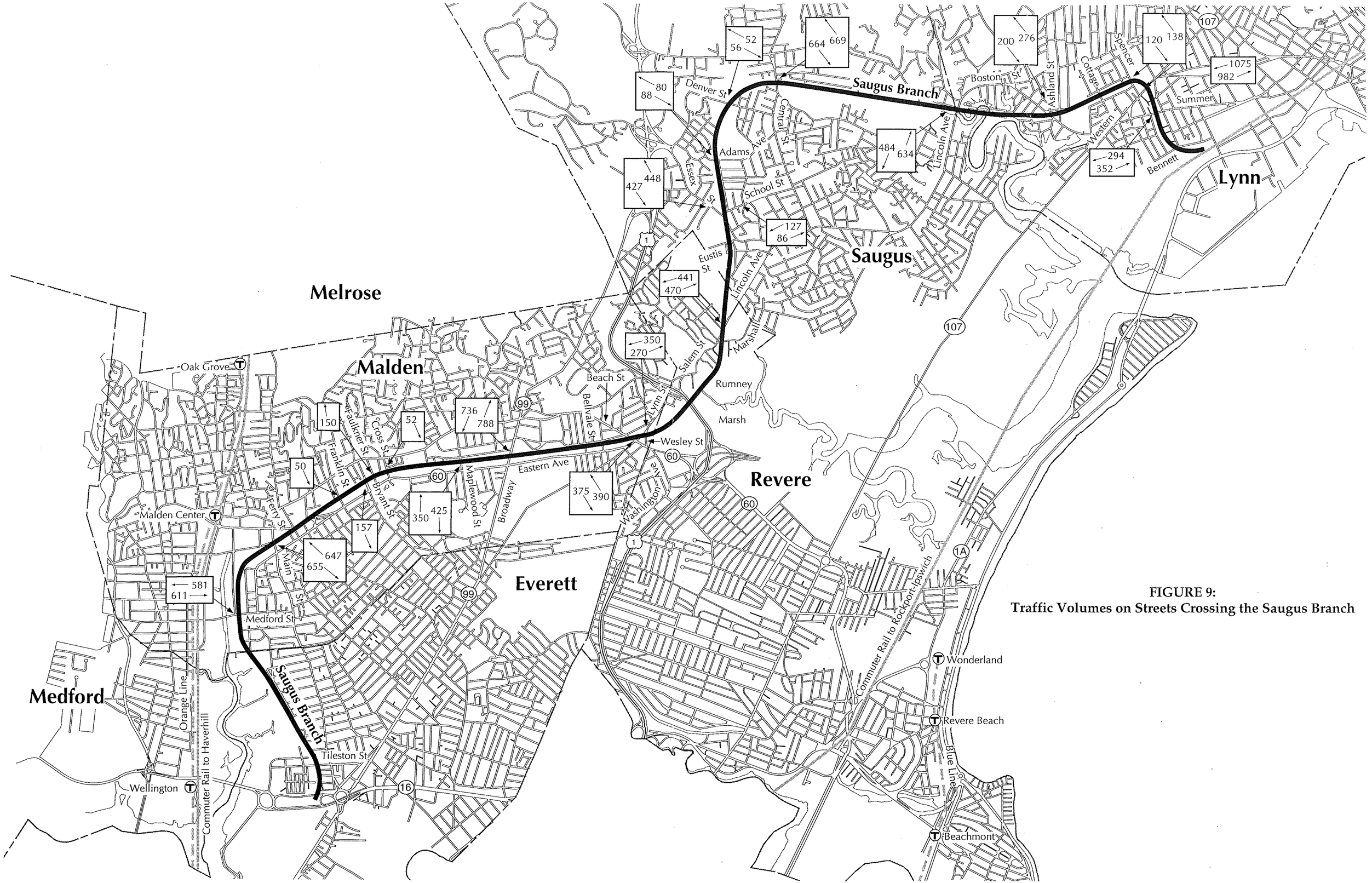


FIGURE 9:
Traffic Volumes on Streets Crossing the Saugus Branch

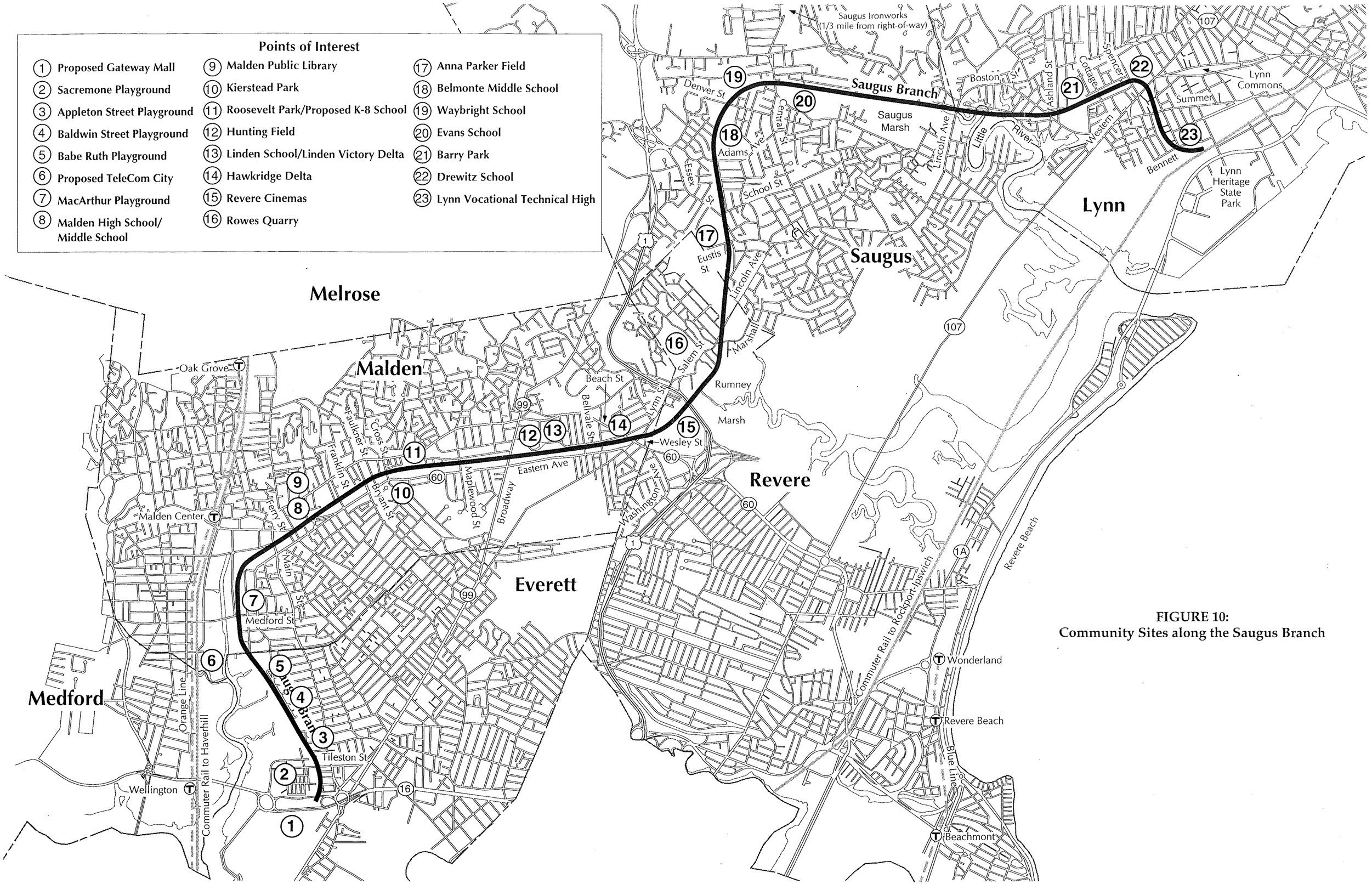


FIGURE 10:
Community Sites along the Saugus Branch

Victory and Hawkridge Deltas. There is a school (grades K-8) proposed for Roosevelt Park. The trail would also provide access to Malden High School, Malden Middle School, the Linden school and the Malden Public Library. The trail, in conjunction with marked routes or lanes, would provide access to Malden Center Station, with connections to the Orange Line and the Haverhill/Reading commuter rail line.

In Revere, after passing the cinemas, the right-of-way opens up to spectacular views of Rumney Marsh. Looking north, there is a good view of Rowes Quarry across Salem Street. Further towards Saugus, there is a connection to Salem Street Park and residential areas. The right-of-way provides direct connections to many facilities in Saugus, including Anna Parker Field, Belmonte Middle School, Waybright Elementary School, and Evans School. The Saugus Iron Works is just north of the proposed trail. The right-of-way then travels along the Saugus Marsh area, providing a very scenic connection into Lynn.

The right-of-way in Lynn travels through densely populated areas. The trail here would provide direct access to Barry Park Playground, the Drewitz School, Lynn Vocational Technical High School, and would be within several blocks of Lynn Common. Some type of on-street accommodations would be needed to reach Lynn Central Station for access to the Rockport/Ipswich commuter rail line. On-road access would also be needed to reach Lynn Heritage State Park. It is important that the trail connect to the shore and eventually the beaches in Revere and Lynn. These are very important regional resources that people will try to reach whether safe access is provided or not. The high accident rate on Revere Beach Boulevard highlights the need to address this area. This project is an opportune time to do so.

There are two major proposed developments that, if built, will abut the proposed trail: the Gateway Mall and TeleCom City. The Gateway Mall would be located on the Monsanto site in Everett, on Mystic View Road, and would access Route 16 at Santilli Circle. The site is just south of Route 16 and just west of the Saugus Branch. Without this proposed development, it would have made more sense to have the trail start north of Route 16, as there is no residential development in the area south of Route 16. Given this major development, however, it would make sense to continue the trial south of Route 16 using the railroad underpass to provide access to the proposed mall. The mall developers are planning to construct a bicycle path along the Malden River, on the west side of the mall. There is an excellent opportunity here for the developers to work with the MDC and the MBTA to make a connection from the Saugus Branch to Route 99 and the MBTA's Wellington Station and then to go beyond the station to connect to the existing MDC Mystic River Path.

The proposed TeleCom City would be located between the Saugus Branch on the east and the Malden River on the west, north of Route 16. It involves Malden,

Medford and Everett. Connections could be made from the Saugus Branch to the park. A trail could then be developed beyond the park to Wellington Station and the Mystic River Path.

D Joint-Use Considerations

There is apparent interest on the part of B&M to abandon freight obligations on the Saugus Branch. (Indicated by a February 29, 1996, memorandum.) As there is no formal application for abandonment as of the publication of this report, it will be assumed that joint use is still a possibility. Therefore, this report examines the implications of joint use, that is, both trail and rail operations within the same corridor. Beyond Franklin Park, there is no active rail use and the trail would be the only use. Even in that portion of the corridor, however, the trail would be designed so as to minimize the cost of reinstituting any future rail service.

There is another joint-use proposal for the Saugus Branch right-of-way. The Tennessee Gas Pipeline Company is proposing to install a gas pipeline from Everett to Revere. Part of the proposal includes using the Saugus Branch from just south of Route 16 in Everett, through the Malden portion, and into Revere, leaving the right-of-way in the Franklin Park area near the Saugus border. This would be an underground, 20-inch natural gas pipeline. The total construction cost is estimated at $23,400,000. The construction period is estimated to be April through November, 1998. Of the 7.54 miles of new pipeline proposed, approximately 70 percent, or just over five miles, would be located within the Saugus Branch right-of-way. This information was obtained from the Environmental Notification Form submitted on January 31, 1996, to the Executive Office of Environmental Affairs.

Although there is room for joint rail and trail use within the active portion, the tracks would have to be moved over to accommodate the trail. As stated in section A of this chapter, a 12-foot trail would need three feet of clearance on each side. The track would require an 8.5-foot clearance on each side from the centerline, or 17 feet total.

The entire right-of-way is about 9.4 miles or 49,300 feet long. There is sufficient room on the north (or west) side for about three-quarters of the right-of-way to place a trail without moving the track. On the south (or east) side, 80 percent of the right-of-way is sufficiently wide for joint use without moving the track. If the trail moved back and forth across the track, the cost of moving the trail would be minimized. It is desirable, however, to minimize the times the trail would cross the track.

As to which side makes more sense to build on, the north side is slightly more constricted, looking at the entire right-of-way. About 11,600 feet of track

would have to be moved to accommodate a trail on the north side, as compared to 9,700 feet on the south side. If one looks only at the portion of the right-of-way that is actively used, the advantage switches to the north side. Between the Everett end and Franklin Park, about 4,000 feet of track would have to be moved to accommodate a trail on the north side, as opposed to 5,700 feet on the south side. Between Franklin Park and Lynn, it would be simpler to remove the track and replace it when and if the need arises.

A well-designed joint-use trail ought to have no impact on the running of freight service. The trail could be separated from the track by fencing. The only crossings the railroad personnel would have to deal with are the ones they deal with now, the street crossings. Trail users would travel parallel to the tracks and would not cross them. The presence of the trail would change the tenor of the entire right-of-way, probably reducing significantly the present problems of vandalism and littering. And if such problems persisted, many more groups would be interested in helping out. Right now, clean up is left to either the B&M or the MBTA.

E Cost

The following cost estimates are extremely preliminary. Much more accurate estimates would be developed at the design stage. The actual construction cost would be determined by the winning bid when the project is advertised for construction.

The construction cost for the rail trail, assuming $250,000 per mile, would be about $2,350,000. Assuming a fence within the joint-use section would add about $50,000. Some additional fencing might be requested and approved to provide privacy for abutting residents or businesses.

The cost of moving the track would be dependent on how much needs to be moved, the condition of the ballast, and whether the existing ties and rails would be used or replaced. Also, the salvage value of materials might be available to the contractor and therefore be an incentive for a lower bid. An additional question is whether all these costs would be borne by the trail budget or not. Given all these uncertainties, no specific estimate is possible, but the cost of moving the track would not be expected to go over $100,000.

The biggest variable is the cost of intersection treatments. A new traffic signal and geometrics, without any land takings, could cost $250,000 per intersection. Simple signage would be under $1,000. Without preliminary design, the number of intersections that might receive significant treatment is unknown. The total cost of the 27 intersection treatments could be anywhere from $25,000 to over a million dollars.

Adding the above, the total cost is estimated to range from $2,500,000 to over $3,000,000. This estimate assumes that all bridges are structurally sound, which seems reasonable given that they recently have been supporting trains.

3 Recommendations

It is recommended that, if the local communities concur, the rail trail be constructed. The trail would be built as a joint-use trail from Everett to the Franklin Park area if rail freight use continues. Beyond Franklin Park, which is the end of the active rail section, the trail should be built to one side of the right-of-way, to minimize the cost should rail service be resumed.

The main safety concern on this trail is its operation at the grade crossings. All trail users would probably be required to stop at all intersections, except perhaps where trail traffic is greater than the road traffic. Some additional traffic controls on motor-vehicle traffic ought to be considered. Traffic control needs to be designed on an intersection-by-intersection basis. There is often a tendency to minimize motor-vehicle delays at the expense of the convenience, and sometimes the safety, of pedestrians and other non motorized users. It is sometimes only after accidents occur that more consideration is given to the pedestrians and bicyclists.

The communities, with help from the Bike-to-the-Sea organization, need to focus at the local level on these safety issues. Bike-to-the-Sea, Inc., has done a great deal of work on seeing the project to this stage and garnering a great deal of political and community support for the project. That energy is best spent now on seeing what measures can be taken to make the trail work safely. While the sections with the least number of intersections could be built first, there is no reason why the whole project could not proceed as long as there was strong support for good safety measures at the intersections.

Discussions need to be held with local police departments, with town engineers and planners, and with community groups to determine what measures they would recommend to help ensure the safety of the future users of the trail. These measures must go beyond engineering issues to include enforcement and education. The engineering issues include signage, traffic signals, geometrics, pavement markings, and other traffic controls. Recommendations in the area of enforcement might include concentrated enforcement of traffic laws, police or other traffic personnel assigned during periods of heavy use or at times when use by school children is particularly high. The actual design of intersections, to be completed in the design phase of this project, should comply with standards developed by the American Association of State Highway and Transportation

Officials (AASHTO) and with the Manual on Uniform Traffic Control Devices (MUTCD).

Education would be provided both to motorists who will cross the trail and to those who will be on it. Parents, perhaps through parent-teacher organizations, need to be told that this trail, although separated from traffic for most of its length, does have intersections that require their children to be cautious. That is, the fact that the trail would be "separated" from traffic may give some people, especially those who have had no experience riding on trails, the idea that it is appropriate for use by youngsters who have insufficient experience with traffic.

While no formal arrangements have been made, the local communities would most likely be the entities responsible for liability, maintenance and policing. The trail would be part of the community's overall responsibility, much as occurs when a new street is added. Bike-to-the-Sea, Inc., is a good source from which local town committees can be formed. Community-based organizations were formed along the Minuteman Bikeway to take on some general maintenance and act as a clearinghouse for discussion of issues that have come up.

Local police attending the public information meetings indicated their support for this concept for two reasons. They see the active use of the right-of-way discouraging both vandalism and 'hanging out.' Experiences with trails in other communities in Massachusetts and elsewhere indicate a new trial does discourage both vandalism and the use of motorized trail vehicles.

While this study has focused on the use of the Saugus Branch, it is important that it be connected by trails or on streets to the major attractors at both ends. At the southern end, the trail needs to connect to the MBTA's Wellington Station and then to the MDC's Mystic River Paths. At the northern end, the trail needs to reach the Atlantic Shore and beaches in both Lynn and Revere.

The lack of pedestrian amenities along Route 16 between the Saugus Branch and Wellington Station makes non-motorized access to Wellington from the east very difficult. A solution may be a connection through the proposed Gateway Mall, as discussed in Chapter 2. Whether or not this alternative is feasible, a connection along Revere Beach Parkway (Route 16) needs to be considered not only for potential trail users but also for residents who live in the neighborhoods north of the Parkway.

At the northern end, the original concept of connecting to the sea needs to be kept. As stated in this report, many trail users will try to reach the ocean and providing a well-designed alternative is paramount for that reason alone. This area of Lynn is very developed with a lot of local and regional traffic. Given the types of

users who would be on the trail, including many children and families, the alternatives must include imaginative designs that will maximize safety and convenience. That is, a route on the existing street system would suffice for experienced bicyclists but not for many of the trail users.

The next formal step toward construction would be a design contract. It is important that the local community dialogue intensify now, for the design contract would hinge on whether the local communities are interested enough to commit to the project. And then the scope of the initial construction phase would depend on what measures the local governments are willing and able to take to see that this proposal works for them, their constituents, and their neighbors.